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NISHI NOBORU
(54) REMOVING METHOD FOR SOLDER PASTE
ADHERED TO SQUEEGEE OF SCREEN
PRINTER

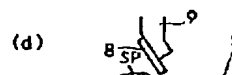
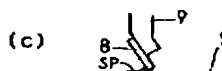
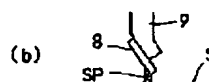
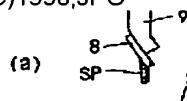
(57) Abstract:

PROBLEM TO BE SOLVED: To automatically remove solder paste suspended from an end of a squeegee by relatively moving parallel to an upper surface of a printing screen while lowering the squeegee, and drawing and cutting the paste in contact with the screen from the squeegee by relative movement.

SOLUTION: After printing is finished, an air cylinder of a printing means is driven from the state that a squeegee 8 is separated above a printing screen S, a pulse motor is then driven, a squeegee head 9 is slightly lowered, and entire moving means is moved reversely to the printing direction. When a lower end of solder paste SP is brought into contact with a part except the printing area of the screen S, the paste SP is drawn in the moving direction of the squeegee 8 by a frictional force between the paste SP and the screen S, and adhered onto the screen S in the state the paste SP is drawn in the moving direction of the squeegee 8 and elongated long. Further, when the squeegee 8 is moved,

the paste SP adhered to the screen S is drawn and cut from an end of the squeegee 8.

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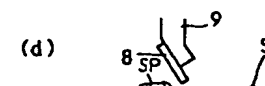
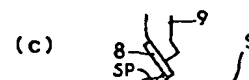
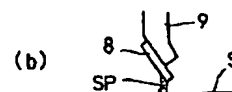
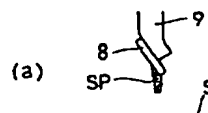
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(54)【発明の名称】 スクリーン印刷機のスキージに付着した半田ペーストの除去方法

(57)【要約】

【課題】 スクリーン印刷機のスキージに付着し、該スキージの先端から垂下した半田ペーストを除去する作業を自動化し、スキージのメンテナンスの作業性を向上し、スキージに付着した半田ペーストの除去作業に伴う生産効率の低下を低減する。

【解決手段】 スキージ8が印刷スクリーンSに対して上方に離間した状態からスキージ8を下降させつつ印刷スクリーンSの上面に対して相対的に平行に移動させ、印刷スクリーンSの上面に接触した半田ペーストSPをスキージ8の印刷スクリーンSに対する相対的な移動によってスキージ8から引き切るようにしたことを特徴とする。



【特許請求の範囲】

【請求項1】 スクリーン印刷機のスキージに付着し、該スキージの先端から垂下した半田ペーストの除去方法であって、前記スキージが印刷スクリーンに対して上方に離間した状態から前記スキージを下降させつつ前記印刷スクリーンの上面に対して相対的に平行に移動させ、前記印刷スクリーンの上面に接触した前記半田ペーストを前記スキージの前記印刷スクリーンに対する相対的な移動によって前記スキージから引き切るようにしたことを特徴とするスクリーン印刷機のスキージに付着した半田ペーストの除去方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、スクリーン印刷機のスキージに付着し、該スキージの先端から垂下した半田ペーストの除去方法に関するものである。

【0002】

【従来の技術】 従来より、回路基板上に、印刷パターンを形成するための開口部を有する印刷スクリーンを載置し、該印刷スクリーン上に半田ペーストを供給し、スキージによって半田ペーストを前記開口部に掃引することにより、回路基板上に印刷パターンを形成するようにしたスクリーン印刷機が知られている。

【0003】

【発明が解決しようとする課題】 上述したスクリーン印刷機では、スキージは、印刷が終了する毎に、垂直方向に上昇し、印刷方向と逆の方向に水平移動して元の位置に復帰する動作を行うが、印刷回数を重ねると、スキージが上昇したときに、スキージに付着した半田ペーストがスキージの先端から垂れ下がるようになり、これをそのまま放置しておくと、スキージが水平移動する際に半田ペーストが印刷スクリーンの印刷範囲内に落下し、次の印刷時に印刷むらが生じることがある。そのため、時々スキージに付着した半田ペーストを除去する必要があるが、これを手作業によって行っているため、手間がかかるという問題が有った。

【0004】 また、スキージに付着した半田ペーストの除去、スキージの交換等のメンテナンスのためにスキージをメンテナンス位置に移動させる場合に、スキージのみを移動させると、半田ペーストが落下して印刷スクリーンの印刷範囲やその他の部分に付着するため、印刷スクリーンをスキージと一緒に移動させなければならず、スキージのメンテナンスを行う際に印刷スクリーンが邪魔になり、メンテナンスを作業性良く行うことができないという問題が有った。

【0005】 さらに、スキージに付着した半田ペーストを除去する作業のために印刷作業が長時間中断し、生産効率が低下するという問題も有った。

【0006】 本発明は、上述した問題点を解決するため

になされたものであって、その目的は、スクリーン印刷機のスキージに付着し、該スキージの先端から垂下した半田ペーストを除去する作業を自動化すること、スキージのメンテナンスの作業性を向上すること、スキージに付着した半田ペーストの除去作業に伴う生産効率の低下を低減することにある。

【0007】

【課題を解決するための手段】 上述した目的を達成するために、本発明は、スクリーン印刷機のスキージに付着し、該スキージの先端から垂下した半田ペーストの除去方法であって、前記スキージが印刷スクリーンに対して上方に離間した状態から前記スキージを下降させつつ前記印刷スクリーンの上面に対して相対的に平行に移動させ、前記印刷スクリーンの上面に接触した前記半田ペーストを前記スキージの前記印刷スクリーンに対する相対的な移動によって前記スキージから引き切るようにしたことを特徴とするものである。

【0008】

【発明の実施の形態】 以下、本発明の具体的な実施形態を図面を参照しながら説明する。図1はスクリーン印刷機の要部の正面図、図2は図1のA-A線断面図、図3はスキージに付着した半田ペーストの除去方法の説明図である。

【0009】 これらの図において、1は印刷スクリーンSを介して回路基板P上にスクリーン印刷を行う印刷手段であり、スクリーン印刷機のハウジングHに水平方向に延びるY軸の方向（図2の矢印C方向）に移動可能に取り付けられたフレーム2を有しており、該フレーム2はモータ等の駆動手段（不図示）によって移動するようになっている。

【0010】 フレーム2の内部には、スキージヘッド支持部材3がガイド部材（不図示）によって上下方向に移動可能に取り付けられている。また、フレーム2の内部には、垂直方向に延び、ボールネジからなる回転軸4が中心線まわりに回転可能に取り付けられており、該回転軸4はスキージヘッド支持部材3の一端に固着されたボールナット5に螺合している。回転軸4の上端は、フレーム2に固着されたパルスモータ6の回転軸にタイミングベルト7を介して連結されており、パルスモータ6を駆動するとスキージヘッド支持部材3が上下方向に移動する。

【0011】 スキージヘッド支持部材3には、Y軸方向に対向配置され、下端にスキージ8が取り付けられた一対のスキージヘッド9、9が上下方向に摺動自在に支持されている。該スキージヘッド9は、スキージヘッド支持部材3の上面に固着されたエアシリンダ10のロッド10aに連結されており、エアシリンダ10を駆動するとスキージヘッド支持部材3に対して上下方向に移動する。エアシリンダ10及びパルスモータ6は、スクリーン印刷機の動作を制御する制御装置（不図示）に接続さ

れている。

【0012】印刷スクリーンSは、印刷手段1の下方に設けられたスクリーン支持枠11に水平に支持されている。スクリーン支持枠11は、ハウジングHにY軸方向に移動可能に取り付けられており、モータ等の駆動手段（不図示）によって移動するようになっている。回路基板Pは、搬送コンベヤ（不図示）によって、印刷位置に設けられた基板支持テーブル12上に載置されるとともに印刷終了後に基板支持テーブルから搬出される。基板支持テーブル12は、モータ等の駆動手段（不図示）によって、X軸方向（図1の矢印B方向）に移動するとともに水平面内で回転するようになっており、前記制御装置が、CCDカメラ（不図示）が撮影した回路基板Pと印刷スクリーンSの画像情報に基づいて基板支持テーブル12及びスクリーン支持枠11を駆動し、回路基板Pと印刷スクリーンSの位置合わせを行うようになっている。

【0013】次に、このスクリーン印刷機の動作について説明する。印刷工程では、まず、搬送コンベヤによって基板支持テーブル12上に搬送されてきた回路基板Pと印刷スクリーンSの位置合わせが行われた後、半田ペースト供給手段（不図示）によって印刷スクリーンS上に半田ペーストが供給される。そして、図2の破線で示すように、右側のスキージヘッド9が、スキージ8の先端が印刷スクリーンSの上面に当接する位置まで下降し、印刷手段1全体が図2の左方向に移動して回路基板P上にパターンを印刷する。印刷が終了すると、搬送コンベヤによってこの回路基板Pが基板支持テーブル12から搬出されるとともに新しい回路基板Pが基板支持テーブル12上に載置される。そして、破線位置にある右側のスキージヘッド9が実線位置に上昇するとともに左側のスキージヘッド9がスキージ8の先端が印刷スクリーンSの上面に当接する位置まで下降し、印刷手段1が図2の右方向に移動して回路基板Pに印刷を行う。

【0014】印刷回数を重ねると、上述したように、印刷終了後にスキージヘッド9が上昇したときに、スキージ8に付着した半田ペーストがスキージ8の先端から垂れ下がるようになる（図3（a）参照）。このスクリーン印刷機では、所定の印刷回数毎に、スキージ8に付着した半田ペーストを除去する動作を行う。次に、その動作について説明する。

【0015】印刷動作の終了後、スキージ8が印刷スクリーンSの上方に離間した状態から、印刷手段1のエアーシリンダ10が駆動され、スキージヘッド9が図3（a）の位置に下降する。次に、パルスモータ6が駆動され、スキージヘッド9が少しずつ下降するとともに、移動手段1全体が印刷方向と逆方向（図3の右方向）に移動する。図3（b）に示すように、半田ペーストSPの下端が印刷スクリーンSの上面に接触すると、半田ペーストSPと印刷スクリーンSの間の摩擦力により、ス

キージ8が移動しても半田ペーストSPは印刷スクリーンS上に留まるため、半田ペーストSPはスキージ8の移動方向に引っ張られ、図3（c）に示すように、スキージ8の移動方向に長く伸びた状態で印刷スクリーンS上に付着してゆく。

【0016】スキージ8の移動に伴い、スキージ8に付着している半田ペーストSPは、その流動性により印刷スクリーンS側に流れてゆき、殆ど全部が印刷スクリーンS上に付着する。スキージ8がさらに移動すると、印刷スクリーンSに付着した半田ペーストSPがスキージ8の先端部から引き切られる。なお、この動作は、印刷スクリーンSにおける印刷範囲以外の部分（開口部が設けられていない部分）で行われる。以上の動作が終了すると、印刷作業が再開される。

【0017】このように、スキージ8に付着した半田ペーストを除去する際にスキージ8をメンテナンス位置に移動させる必要が無く、且つ半田ペーストの除去作業を極めて短時間で行うことができるため、印刷作業の中断時間が短い。したがって、半田ペーストの除去作業に伴う生産効率の低下を低減することができる。

【0018】なお、上記実施形態では、一方のスキージ8から垂下した半田ペーストを除去する場合についての説明したが、他方のスキージ8から垂下した半田ペーストも上記と同様の動作によって除去することができる。また、上記実施形態では、スキージ8を下降させつつ印刷スクリーンSに対して平行な方向に移動させるようにしているが、これに代えて、スキージ8が下降動作のみを行い、印刷スクリーンSが水平方向に移動するようにしても良い。

【0019】

【発明の効果】以上説明したように、本発明によれば、スキージに付着し、該スキージの先端から垂下した半田ペーストを自動的に除去することができる。また、スキージに付着した半田ペーストを印刷スクリーンに付着させて除去するようにしたことにより、スキージのメンテナンスの際に、スキージに付着した半田ペーストを除去してからスキージをメンテナンス位置に移動させることができるので、スキージの移動中に半田ペーストが落下することが無く、印刷スクリーンを印刷位置に留めたままスキージのみをメンテナンス位置に移動させることができる。したがって、スキージのメンテナンスの際に印刷スクリーンが邪魔にならないため、メンテナンスの作業性が向上する。また、スキージに付着した半田ペーストを除去する際にスキージをメンテナンス位置に移動させる必要が無く、且つ半田ペーストの除去作業を極めて短時間で行うことができるため、印刷作業の中断時間が短い。したがって、半田ペーストの除去作業に伴う生産効率の低下を低減することができる。

【図面の簡単な説明】

【図1】 本発明を適用したスクリーン印刷機の要部の

正面図。

【図2】 図1のA-A線断面図。

【図3】 スキージに付着した半田ペーストの除去方法を
を示す説明図。

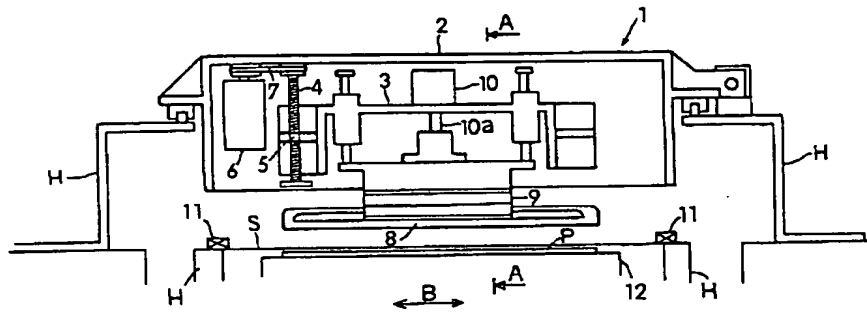
【符号の説明】

8 スキージ

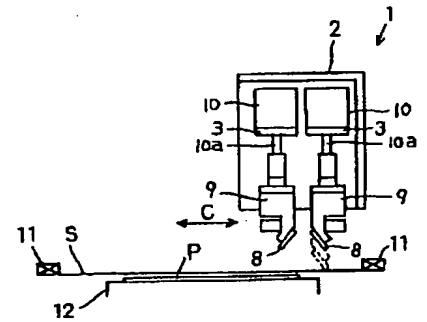
S 印刷スクリーン

SP 半田ペースト

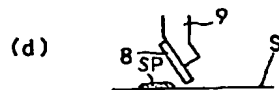
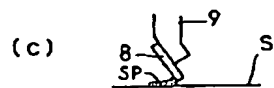
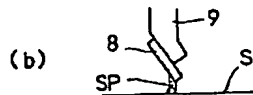
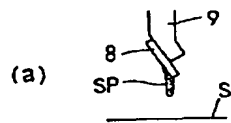
【図1】



【図2】



【図3】



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(71)Applicant : SANYO ELECTRIC CO LTD

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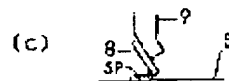
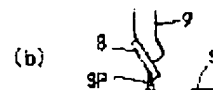
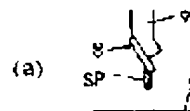
(72)Inventor : HAMADA SHOJI
NISHI NOBORU

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SOLUTION: After printing is finished, an air cylinder of a printing means is driven from the state that a squeegee 8 is separated above a printing screen S, a pulse motor is then driven, a squeegee head 9 is slightly lowered, and entire moving means is moved reversely to the printing direction. When a lower end of solder paste SP is brought into contact with a part except the printing area of the screen S, the paste SP is drawn in the moving direction of the squeegee 8 by a frictional force between the paste SP and the screen S, and adhered onto the screen S in the state the paste SP is drawn in the moving direction of the squeegee 8 and elongated long. Further, when the squeegee 8 is moved, the paste SP adhered to the screen S is drawn and cut from an end of the squeegee 8.



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CLAIMS

[Claim(s)]

[Claim 1] It is the removal method of the soldering paste which adhered to the squeegee of a screen-stencil machine and hung from the nose of cam of this squeegee. It is made to move in parallel relatively to the upper surface of the aforementioned printing screen, dropping the aforementioned squeegee from the state which the aforementioned squeegee estranged up to the printing screen. The removal method of a soldering paste adhering to the squeegee of the screen-stencil machine characterized by having lengthened the aforementioned soldering paste in contact with the upper surface of the aforementioned printing screen from the aforementioned squeegee by relative movement to the aforementioned printing screen of the aforementioned squeegee.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention adheres to the squeegee of a screen-stencil machine, and relates to the removal method of the soldering paste which hung from the nose of cam of this squeegee.

[0002]

[Description of the Prior Art] The screen-stencil machine in which the printing pattern was formed on the circuit board is known by laying the printing screen which has opening for forming a printing pattern on the circuit board conventionally, supplying a soldering paste on this printing screen, and sweeping a soldering paste on the aforementioned opening by the squeegee.

[0003]

[Problem(s) to be Solved by the Invention] Although operation which goes up perpendicularly, carries out horizontal displacement in the direction contrary to the printing direction, and returns to the original position is performed in the screen-stencil machine mentioned above whenever printing ends a squeegee If the soldering paste adhering to the squeegee comes to hang down from the nose of cam of a squeegee and leaves this as it is when the number of times of printing was piled up and a squeegee goes up In case a squeegee carries out horizontal displacement, a soldering paste may fall to printing within the limits of a printing screen, and printing unevenness may arise at the time of the next printing. Therefore, although the soldering paste which sometimes adhered to the squeegee needed to be removed, since the handicraft was performing this, there was a problem of taking time and effort.

[0004] Moreover, if only a squeegee is moved when moving a squeegee to a maintenance position for maintenances, such as removal of the soldering paste adhering to the squeegee, and exchange of a squeegee Since a soldering paste falls and it adheres to the portions of the printing range of a printing screen, or others, The printing screen had to be moved together with the squeegee, when maintaining a squeegee, the printing screen became obstructive, and there was a problem that it was unmaintainable with sufficient workability.

[0005] Furthermore, printing work was interrupted for a long time for the work which removes the soldering paste adhering to the squeegee, and there was also a problem that productive efficiency fell.

[0006] Made in order that this invention may solve the trouble mentioned above, the purpose adheres to the squeegee of a screen-stencil machine, and is to reduce [automating the work which removes the soldering paste which hung from the nose of cam of this squeegee, improving the workability of a maintenance of a squeegee, and] decline in the productive efficiency accompanying the removal work of the soldering paste adhering to the squeegee.

[0007]

[Means for Solving the Problem] In order to attain the purpose mentioned above, this invention adheres to the squeegee of a screen-stencil machine. It is made to move in parallel relatively to the upper surface of the aforementioned printing screen, dropping the aforementioned squeegee from the state which is the removal method of the soldering paste which hung from the nose of cam of this squeegee, and the aforementioned squeegee estranged up to the printing screen. It is characterized by having lengthened the aforementioned soldering paste in contact with the upper surface of the aforementioned printing screen from the aforementioned squeegee by relative movement to the aforementioned printing screen of the aforementioned squeegee.

[0008]

[Embodiments of the Invention] Hereafter, the concrete operation gestalt of this invention is explained, referring to a drawing.

Drawing 1 is explanatory drawing of the removal method of a soldering paste that the front view of the important section of a screen-stencil machine and drawing 2 adhered to the A-A line cross section of drawing 1 , and drawing 3 adhered to the squeegee.

[0009] In these drawings, 1 is a printing means to screen-stencil on the circuit board P through the printing screen S, it has the frame 2 attached possible [movement to Y shaft orientation (the direction of arrow C of drawing 2) horizontally prolonged in the housing H of a screen-stencil machine], and this frame 2 moves by driving means (un-illustrating), such as a motor.

[0010] The squeegee head supporter material 3 is attached in the interior of a frame 2 possible [movement in the vertical direction] by the guide member (un-illustrating). Moreover, it is prolonged perpendicularly, the axis of rotation 4 which consists of a ball screw is attached in the interior of a frame 2 possible [rotation] at the circumference of a center line, and this axis of rotation 4 is screwed in the ball nut 5 which fixed at the end of the squeegee head supporter material 3. The upper limit of the axis of rotation 4 is connected with the axis of rotation of the stepping motor 6 which fixed on the frame 2 through the timing belt 7.

and if a stepping motor 6 is driven, the squeegee head supporter material 3 will move in the vertical direction.

[0011] Opposite arrangement is carried out at Y shaft orientations, and the squeegee heads 9 and 9 of the couple by which the squeegee 8 was attached in the soffit are supported free [sliding of the vertical direction] by the squeegee head supporter material 3. This squeegee head 9 is connected with rod 10a of the pneumatic cylinder 10 which fixed on the upper surface of the squeegee head supporter material 3, and if a pneumatic cylinder 10 is driven, it will move in the vertical direction to the squeegee head supporter material 3. The pneumatic cylinder 10 and the stepping motor 6 are connected to the control unit (un-illustrating) which controls operation of a screen-stencil machine.

[0012] The printing screen S is supported at a level with the screen housing 11 in which the printing means 1 was formed caudad. The screen housing 11 is attached in Housing H possible [movement to Y shaft orientations], and moves by driving means (un-illustrating), such as a motor. The circuit board P is taken out from a substrate support table after a printing end while it is laid on the substrate support table 12 prepared in the printing position by conveyance conveyer (un-illustrating). By driving means (un-illustrating), such as a motor, the substrate support table 12 rotates in the level surface, and the aforementioned control unit drives the substrate support table 12 and the screen housing 11 based on the image information of the circuit board P which the CCD camera (un-illustrating) photoed, and the printing screen S, and it performs alignment of the circuit board P and the printing screen S while it moves to X shaft orientations (the direction of arrow B of drawing 1).

[0013] Next, operation of this screen-stencil machine is explained. In presswork, after alignment of the circuit board P and the printing screen S which have been conveyed on the substrate support table 12 by conveyance conveyer is performed first, a soldering paste is supplied by the soldering-paste supply means (un-illustrating) on the printing screen S. And as the dashed line of drawing 2 shows, the right-hand side squeegee head 9 descends to the position where the nose of cam of a squeegee 8 contacts the upper surface of the printing screen S, and the printing means 1 whole moves leftward [of drawing 2], and prints a pattern on the circuit board P. After printing is completed, while this circuit board P is taken out from the substrate support table 12 by conveyance conveyer, the new circuit board P is laid on the substrate support table 12. And while the squeegee head 9 of the right-hand side in a dashed line position goes up to real line position, the left-hand side squeegee head 9 descends to the position where the nose of cam of a squeegee 8 contacts the upper surface of the printing screen S, and the printing means 1 moves rightward [of drawing 2], and prints to the circuit board P.

[0014] When the number of times of printing was piled up and the squeegee head 9 goes up after a printing end as mentioned above, the soldering paste adhering to the squeegee 8 comes (refer to drawing 3 (a)) to hang down from the nose of cam of a squeegee 8. In this screen-stencil machine, operation which removes the soldering paste adhering to the squeegee 8 is performed for every predetermined number of times of printing. Next, the operation is explained.

[0015] After the end of printing operation, from the state which the squeegee 8 estranged above the printing screen S, the pneumatic cylinder 10 of the printing means 1 drives, and the squeegee head 9 descends to the position of drawing 3 (a). Next, while a stepping motor 6 drives and the squeegee head 9 descends little by little, the move means 1 whole moves to the printing direction and an opposite direction (right of drawing 3). Since soldering-paste SP will stop on the printing screen S with the frictional force between the Handa *-strike SP and the printing screen S even if a squeegee 8 moves if soldering-paste SP's soffit contacts the upper surface of the printing screen S as shown in drawing 3 (b), soldering-paste SP is pulled in the move direction of a squeegee 8, and as shown in drawing 3 (c), he adheres on the printing screen S in the state where it was prolonged for a long time in the move direction of a squeegee 8.

[0016] With movement of a squeegee 8, soldering-paste SP adhering to the squeegee 8 flows to the printing screen S side by the fluidity, and all almost adhere on the printing screen S. If a squeegee 8 moves further, soldering-paste SP adhering to the printing screen S will have been lengthened from the point of a squeegee 8. In addition, this operation is performed in portions other than the printing range in the printing screen S (portion in which opening is not prepared). An end of the above operation resumes printing work.

[0017] Thus, since there is no need of moving a squeegee 8 to a maintenance position and the removal work of a soldering paste can be extremely done in a short time in case the soldering paste adhering to the squeegee 8 is removed, the downtime of printing work is short. Therefore, decline in the productive efficiency accompanying the removal work of a soldering paste can be reduced.

[0018] In addition, although the above-mentioned operation gestalt explained only the case where the soldering paste which hung from one squeegee 8 was removed, the soldering paste which hung from the squeegee 8 of another side is also removable with the same operation as the above. Moreover, although it is made to make it move in the parallel direction to the printing screen S with the above-mentioned operation gestalt, dropping a squeegee 8, it replaces with this, a squeegee 8 performs only downward operation, and you may make it the printing screen S move horizontally.

[0019]

[Effect of the Invention] As explained above, according to this invention, it adheres to a squeegee and the soldering paste which hung from the nose of cam of this squeegee can be removed automatically. Moreover, only a squeegee can be moved to a maintenance position, a soldering paste's not falling during movement of a squeegee and stopping a printing screen to the printing position, since the squeegee was moved to the maintenance position by making the soldering paste adhering to the squeegee adhere to a printing screen, and having removed it after removing the soldering paste which adhered to the squeegee on the occasion of the maintenance of a squeegee. Therefore, since a printing screen does not become obstructive in the case of the maintenance of a squeegee, the workability of a maintenance improves. Moreover, since there is no need of moving a squeegee to a maintenance position and the removal work of a soldering paste can be extremely done in a short time in case the soldering

paste adhering to the squeegee is removed, the downtime of printing work is short. Therefore, decline in the productive efficiency accompanying the removal work of a soldering paste can be reduced.

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention adheres to the squeegee of a screen-stencil machine, and relates to the removal method of the soldering paste which hung from the nose of cam of this squeegee.

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PRIOR ART

[Description of the Prior Art] The screen-stencil machine in which the printing pattern was formed on the circuit board is known by laying the printing screen which has opening for forming a printing pattern on the circuit board conventionally, supplying a soldering paste on this printing screen, and sweeping a soldering paste on the aforementioned opening by the squeegee.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, it adheres to a squeegee and the soldering paste which hung from the nose of cam of this squeegee can be removed automatically. Moreover, only a squeegee can be moved to a maintenance position, a soldering paste's not falling during movement of a squeegee and stopping a printing screen to the printing position, since the squeegee was moved to the maintenance position by making the soldering paste adhering to the squeegee adhere to a printing screen, and having removed it after removing the soldering paste which adhered to the squeegee on the occasion of the maintenance of a squeegee. Therefore, since a printing screen does not become obstructive in the case of the maintenance of a squeegee, the workability of a maintenance improves. Moreover, since there is no need of moving a squeegee to a maintenance position and the removal work of a soldering paste can be extremely done in a short time in case the soldering paste adhering to the squeegee is removed, the downtime of printing work is short. Therefore, decline in the productive efficiency accompanying the removal work of a soldering paste can be reduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although operation which goes up perpendicularly, carries out horizontal displacement in the direction contrary to the printing direction, and returns to the original position is performed in the screen-stencil machine mentioned above whenever printing ends a squeegee. If the soldering paste adhering to the squeegee comes to hang down from the nose of cam of a squeegee and leaves this as it is when the number of times of printing was piled up and a squeegee goes up. In case a squeegee carries out horizontal displacement, a soldering paste may fall to printing within the limits of a printing screen, and printing unevenness may arise at the time of the next printing. Therefore, although the soldering paste which sometimes adhered to the squeegee needed to be removed, since the handicraft was performing this, there was a problem of taking time and effort.

[0004] Moreover, if only a squeegee is moved when moving a squeegee to a maintenance position for maintenances, such as removal of the soldering paste adhering to the squeegee, and exchange of a squeegee. Since a soldering paste falls and it adheres to the portions of the printing range of a printing screen, or others, The printing screen had to be moved together with the squeegee, when maintaining a squeegee, the printing screen became obstructive, and there was a problem that it was unmaintainable with sufficient workability.

[0005] Furthermore, printing work was interrupted for a long time for the work which removes the soldering paste adhering to the squeegee, and there was also a problem that productive efficiency fell.

[0006] Made in order that this invention may solve the trouble mentioned above, the purpose adheres to the squeegee of a screen-stencil machine, and is to reduce [automating the work which removes the soldering paste which hung from the nose of cam of this squeegee, improving the workability of a maintenance of a squeegee, and] decline in the productive efficiency accompanying the removal work of the soldering paste adhering to the squeegee.

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MEANS

[Means for Solving the Problem] In order to attain the purpose mentioned above, this invention adheres to the squeegee of a screen-stencil machine. It is made to move in parallel relatively to the upper surface of the aforementioned printing screen, dropping the aforementioned squeegee from the state which is the removal method of the soldering paste which hung from the nose of cam of this squeegee, and the aforementioned squeegee estranged up to the printing screen. It is characterized by having lengthened the aforementioned soldering paste in contact with the upper surface of the aforementioned printing screen from the aforementioned squeegee by relative movement to the aforementioned printing screen of the aforementioned squeegee.

[0008]

[Embodiments of the Invention] Hereafter, the concrete operation gestalt of this invention is explained, referring to a drawing.

Drawing 1 is explanatory drawing of the removal method of a soldering paste that the front view of the important section of a screen-stencil machine and drawing 2 adhered to the A-A line cross section of drawing 1, and drawing 3 adhered to the squeegee.

[0009] In these drawings, 1 is a printing means to screen-stencil on the circuit board P through the printing screen S, it has the frame 2 attached possible [movement to Y shaft orientation (the direction of arrow C of drawing 2) horizontally prolonged in the housing H of a screen-stencil machine], and this frame 2 moves by driving means (un-illustrating), such as a motor.

[0010] The squeegee head supporter material 3 is attached in the interior of a frame 2 possible [movement in the vertical direction] by the guide member (un-illustrating). Moreover, it is prolonged perpendicularly, the axis of rotation 4 which consists of a ball screw is attached in the interior of a frame 2 possible [rotation] at the circumference of a center line, and this axis of rotation 4 is screwed in the ball nut 5 which fixed at the end of the squeegee head supporter material 3. The upper limit of the axis of rotation 4 is connected with the axis of rotation of the stepping motor 6 which fixed on the frame 2 through the timing belt 7, and if a stepping motor 6 is driven, the squeegee head supporter material 3 will move in the vertical direction.

[0011] Opposite arrangement is carried out at Y shaft orientations, and the squeegee heads 9 and 9 of the couple by which the squeegee 8 was attached in the soffit are supported free [sliding of the vertical direction] by the squeegee head supporter material 3. This squeegee head 9 is connected with rod 10a of the pneumatic cylinder 10 which fixed on the upper surface of the squeegee head supporter material 3, and if a pneumatic cylinder 10 is driven, it will move in the vertical direction to the squeegee head supporter material 3. The pneumatic cylinder 10 and the stepping motor 6 are connected to the control unit (un-illustrating) which controls operation of a screen-stencil machine.

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[0013] Next, operation of this screen-stencil machine is explained. In presswork, after alignment of the circuit board P and the printing screen S which have been conveyed on the substrate support table 12 by conveyance conveyer is performed first, a soldering paste is supplied by the soldering-paste supply means (un-illustrating) on the printing screen S. And as the dashed line of drawing 2 shows, the right-hand side squeegee head 9 descends to the position where the nose of cam of a squeegee 8 contacts the upper surface of the printing screen S, and the printing means 1 whole moves leftward [of drawing 2], and prints a pattern on the circuit board P. After printing is completed, while this circuit board P is taken out from the substrate support table 12 by conveyance conveyer, the new circuit board P is laid on the substrate support table 12. And while the squeegee head 9 of the right-hand side in a dashed line position goes up to real line position, the left-hand side squeegee head 9 descends to the position where the nose of cam of a squeegee 8 contacts the upper surface of the printing screen S, and the printing means 1 moves rightward [of drawing 2], and prints to the circuit board P.

[0014] When the number of times of printing was piled up and the squeegee head 9 goes up after a printing end as mentioned above, the soldering paste adhering to the squeegee 8 comes (refer to drawing 3 (a)) to hang down from the nose of cam of a squeegee 8. In this screen-stencil machine, operation which removes the soldering paste adhering to the squeegee 8 is performed for every predetermined number of times of printing. Next, the operation is explained.

[0015] After the end of printing operation, from the state which the squeegee 8 estranged above the printing screen S, the pneumatic cylinder 10 of the printing means 1 drives, and the squeegee head 9 descends to the position of drawing 3 (a). Next, while a stepping motor 6 drives and the squeegee head 9 descends little by little, the move means 1 whole moves to the printing direction and an opposite direction (right of drawing 3). Since soldering-paste SP will stop on the printing screen S with the frictional force between the Handa **.strike SP and the printing screen S even if a squeegee 8 moves if soldering-paste SP's softit contacts the upper surface of the printing screen S as shown in drawing 3 (b), soldering-paste SP is pulled in the move direction of a squeegee 8, and as shown in drawing 3 (c), he adheres on the printing screen S in the state where it was prolonged for a long time in the move direction of a squeegee 8.

[0016] With movement of a squeegee 8, soldering-paste SP adhering to the squeegee 8 flows to the printing screen S side by the fluidity, and all almost adhere on the printing screen S. If a squeegee 8 moves further, soldering-paste SP adhering to the printing screen S will have been lengthened from the point of a squeegee 8. In addition, this operation is performed in portions other than the printing range in the printing screen S (portion in which opening is not prepared). An end of the above operation resumes printing work.

[0017] Thus, since there is no need of moving a squeegee 8 to a maintenance position and the removal work of a soldering paste can be extremely done in a short time in case the soldering paste adhering to the squeegee 8 is removed, the downtime of printing work is short. Therefore, decline in the productive efficiency accompanying the removal work of a soldering paste can be reduced.

[0018] In addition, although the above-mentioned operation gestalt explained only the case where the soldering paste which hung from one squeegee 8 was removed, the soldering paste which hung from the squeegee 8 of another side is also removable with the same operation as the above. Moreover, although it is made to make it move in the parallel direction to the printing screen S with the above-mentioned operation gestalt, dropping a squeegee 8, it replaces with this, a squeegee 8 performs only downward operation, and you may make it the printing screen S move horizontally.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Front view of the important section of the screen-stencil machine which applied this invention.

[Drawing 2] The A-A line cross section of drawing 1.

[Drawing 3] Explanatory drawing showing the removal method of a soldering paste adhering to the squeegee.

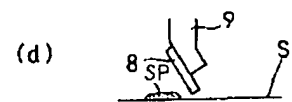
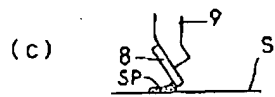
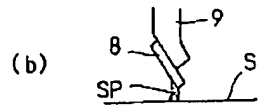
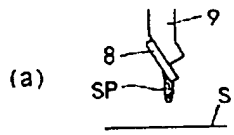
[Description of Notations]

8 Squeegee

S Printing screen

SP Soldering paste

[Translation done.]



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